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Bakun – Where should all the power go?

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ABSTRACT

Deem as one of the few mega projects of such scale in this part of the world, the largest hydroelectric dam in the Southeast Asia region, Bakun in Sarawak, is expected to complete by end of 2010. The project first initiated back in 1980s is finally near fruition more than two decades later after much controversies and obstacles. With power generation expected to start in July 2011, there are much debates on how to deal with its 2400 MW maximum capacity now that the preliminary undersea transmission cable project to transfer 1600 MW to Peninsular Malaysia is called off and all that hydropower will be contained within Sarawak. On top of that, Murum dam will add another 944 MW to the grid by end of 2013 and several other dams are reportedly afoot for construction, all within the state of Sarawak. This will result in excessive energy generation in the state while Peninsular is projected to face power shortage by 2015 with the submarine cable project scrapped. This paper presents the numerous issues related to the Bakun project that have surfaced over the years.

Contents

1. Introduction

The Bakun project comprises the construction of a 2400 MW hydroelectric dam, electricity transmission facilities and related infrastructures which include access roads, a new township and an airport. The project was conceived to support the Malaysian Government's Fuel Diversification Policy as hydropower is a clean source of energy. It will significantly contribute to meeting the increasing demand of electricity in the country. The dam bridges the Balui River, about 37 km upstream of Belaga and 200 km from Bintulu, in Sarawak, which is one of the two East Malaysia states (another state is Sabah) which form the northern part of the island of Borneo. The transmission of its generated electricity would necessitate some 1500 km of high-voltage (up to 500 kV) direct current transmission lines and a possible four 650-km long undersea cables across the South China Sea to Peninsular Malaysia. Fig. 1 is the map showing the location of Bakun dam and the proposed transmission route for the submarine cable.

The dam is a 207-m-high concrete face rockfill dam (CFRD), making it the second highest concrete-faced rockfill dam in the world, with a crest length of 750 m, a base width of 560 m and a crest width of 12 m, making it one of the highest rockfill dams ever constructed. It will flood almost 70,000 ha of land, an area larger than the Republic of Singapore once impounded. Its catchment area

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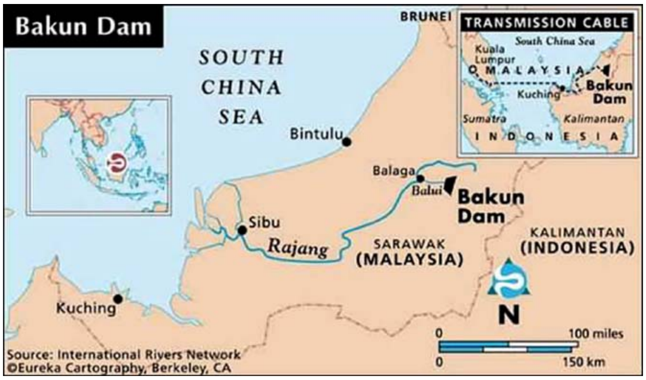


Fig. 1. The location of Bakun dam and Balui River in Sarawak. The proposed submarine transmission cable from Sarawak to Peninsular Malaysia (inset: right) [1].



Fig. 2. Part of the Bakun hydroelectric dam.

is over 1.5 million ha of mostly primary forest with a capacity of 43.8 billion m^3, easily making it the largest dam in Asia outside of China. At the peak of its construction activity, a workforce of more than 3000 is on the site, which includes experts and engineers from all over the world. Its power is generated by eight 300 MW turbines, producing a maximum installed capacity of 2400 MW [2]. Figs. 2–4 show some of the latest progress which has taken place in Bakun. Full completion is expected by December 2010 after several delays



Fig. 3. The 207-m-high concrete rockfill dam in Bakun. It has a two-lane road on the top of the wall that overlooks a reservoir that is the size of Singapore.



Fig. 4. Aerial view of the Balui River and Bakun dam from 3000 ft.

that span over 20 years, with its first phase of power generation likely by July 2011.

This paper mainly focuses on the numerous controversies and issues that have clouded the Bakun project since its first inception until now. How the potential of the dam can be harvested and the oversupply concerns also form parts of the discussions. Not many referred articles have been published on Bakun, resulting in most references made are from online articles, media releases and companies' reports. All information presented here is deemed correct at this point of writing.

2. Controversial past

Some may hail Bakun dam as an engineering triumph, but many associate the project with its troubled past and its future impact on Sarawak's economy once it is fully operational. The hydro potential of Sarawak, a predominantly forested Malaysian state on the island of Borneo with relatively light population, was first examined more than 40 years ago by Australian surveyors. Subsequent studies identified numerous potential hydroelectric sites, including Bakun. Another study found that while thermal power plants would be slightly cheaper to build, a dam at the Bakun site would have lower operating costs. The Bakun project, which was to be a part of a series of dams, was subjected to several dozen separate studies covering technical, economic and environmental aspects. Serious discussions on the project started back in early 1980s and by 1986, the Malaysian Government had decided to proceed with it, but was later shelved due to the recession and economic crisis in the late 1980s which dampened the Government's optimism on the growth of electricity and power demand. At the same time, the availability of natural gas for electricity generation caused the project to lose its status as the least-cost effective option for Peninsular Malaysia [3].

Nevertheless, a review of the project in 1992 concluded that the project was economically viable and a year later the then Prime Minister Tun Dr Mahathir Mohamad revived the project, citing the money that had been spent on pre-construction works should not go to waste. Other reasons to support the revival include the ambition to align the indigenous people with the mainstream of development through resettlement and to provide much needed infrastructure to the remote parts of Sarawak. The construction resumed in 1994 by a privatized joint-venture between Ekran Ltd., Tenaga Nasional Bhd. (TNB), Sarawak Electricity Supply Corporation (SESC), Malaysia Mining Corporation (MMC) and the Sarawak Government, to form the Bakun Hydroelectric Corporation, and full commissioning was expected by 2005.

Work came to a halt again in 1997, this time indefinitely along with all other major projects in the country as announced by the

then Deputy Prime Minister and Finance Minister, Datuk Anwar Ibrahim, due to the Asian financial crisis. By the time the federal government took back the project from the consortium, RM1.6 bil (US$500 mil) had already been spent with some RM1 bil (US$313 mil) paid out as compensation by the government to Ekran Ltd. [4].

Following the setback, the mega project was given yet another lifeline in 2000, but the transmission of power to Peninsular was not part of the revival this time. Many believed the real reason for reviving the project was politically driven as elections were due to be held in Sarawak in September 2001 and resuming construction work would give a much needed boost to the local economy. Companies owned by or having close connections with the Sarawak Chief Minister and his associates were expected to win most of the bids. It would also have created thousands of jobs and given the country's ailing construction industry a shot in the arm [5]. Taken over by the federal government arm Sarawak Hidro, a new date of completion was set at February 2008. The construction work was tendered out as a turnkey contract and the main builder was Malaysia-China Hydro Joint Venture, a consortium headed by Sime Engineering Ltd. of Malaysia and Sino-Hydro Corporation of China. Civil works recommenced in October 2002 with estimated cost of RM1.8 bil (US$563 mil) at that point. Reports had it that along the way, there were several changes in plans which included scaling down to 500 MW capacity and subsequently reverting to the original size. Not long after that, the submarine cable was revived, but estimated to involve a further RM10 bil (US$3.13 bil) [6].

In 2008, Sime Darby, the mother company of Sime Engineering and one of the largest government-linked public listed companies, was reported to have abandoned a proposal to buy up to 60% of Sarawak Hidro, citing rising costs as a reason. It also pulled out from owning a controlling stake in the 700-km submarine cable plan, stretching from Sarawak to Johore (the most southern state in Peninsular). In the following year, the government-owned electricity utility firm, TNB announced that it would partner Sarawak Energy Bhd. (SEB), the state electricity utility firm, to develop the power transmission system. But the submarine cable plan has since been called off again in mid-2010 and all the electricity supply from the dam will now channel to SEB and contain within Sarawak.

3. Energy demand in Sarawak and the Peninsular

The flooding of the dam is due by mid of October 2010 and by July 2011, one of the Bakun's eight turbines is expected to begin generating 300 MW. This will subsequently increase to 900 MW by end of 2011 and the massive dam shall be fully commissioned by end of 2012, unleashing all its 2400 MW of hydropower, which will all be contained within Sarawak. Given that Sarawak's current electricity generation capacity stands at around 1300 MW while its peak demand hovering around 1000 MW (see Fig. 5), it is rather obvious the additional 2400 MW would be too much for the state to handle. Not to mention the 944-MW Murum dam which will complete by 2013 and few other dams which are in the pipeline. In total, based on studies conducted earlier for the state utility firm, Sarawak has over 20,000 MW of hydropower potential.

The Bakun hydroelectric plant has long been planned as part of the solutions for the growing energy demand in Peninsular Malaysia. The peak demand in the Peninsular has risen from 13,620 MW in 2007 to 14,245 MW in 2009. Projection for 2010 is estimated at 15,072 MW with total available capacity that stands at 21,052 MW as of June 2010 [7]. Electricity demand has been growing between 5% and 8% annually in the Peninsular while current electricity reserve margin is still at a healthy 42%. However, judging from the demand growth trend, the margin will be halved soon and the Peninsular will face the possibility of an energy crunch by 2015. Hence, the government is desperately seeking to fill the

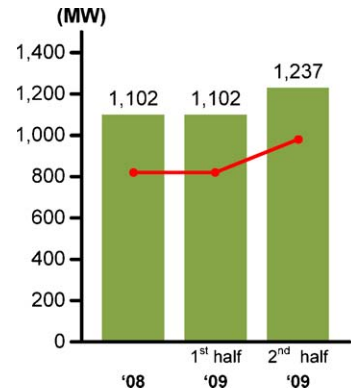


Fig. 5. Energy generating capacity and peak demand in Sarawak [8].

1600-MW gap from Bakun now that the submarine cable project is scrapped.

4. Counting costs

Due to the many delays over the years, the cost of the Bakun dam has escalated to RM7.3 bil (US$2.28 bil) from the initial RM3 bil–RM4 bil (US$0.94 bil–US$1.25 bil). Funding for the construction is mainly via borrowings from the Malaysia's Employees Provident Fund (EPF) and the Pensions Fund. If the submarine cable project were to materialize, it will add another RM10 bil (US$3.13 bil) to the total amount. But the submarine project is off the table now and all the power has to be sold to the state-owned SEB. Sarawak Hidro is currently bearing all the costs and with the Sarawak Government pressing for a lower bill, the federal government is in a difficult position to decide on how much to discount. At the moment, no final decision has been reached yet and the standing instruction is to bill in full.

Any longer delay will not do anyone any good as the whole project is funded by public monies. Salaries and consultancy fees alone in Sarawak Hidro come to RM1.3 mil (US$406,250) per month. After the dam is impounded and the turbines commissioned, their operation and maintenance costs will add up to RM13 mil (US$4.06 mil) per year. Interest payments during construction period are estimated to be around RM1.1 bil (US$343.75 mil) and the federal government paid a RM950 mil (US$296.88 mil) compensation package to Ekran when it took over the project. Also, more than RM500 mil (US$156.25 mil) has been spent for resettlement [9].

The first turbine can start operation by mid of 2011, 7 months after the expected flooding. Any delay in this impoundment and supply of power processes will result in a revenue loss of RM10 mil (US$3.13 mil) per month. Prior to this, although the dam has met all the technical requirements for flooding in April 2010, the state government has yet to give the green light for impoundment. Obviously, both sides of the governments have yet to arrive at an amicable agreement. To date, Sarawak Hidro still needs to pay back EPF and Pensions Fund a total of RM5.75 bil (US$1.80 bil), and at the same time provide a reasonable rate of return estimated at around 8.5% to the federal government. If the impoundment can be carried out by end of 2010, the project cost may be capped at around RM7.3 bil [10]. Any further delay will escalate the already hefty cost and bring upon many unnecessary expenses.

5. Tapping potential

As the Bakun hydroelectric plant is expected to run at its full 2400 MW capacity by end of 2012, vigilant planning is crucial to ensure all those power generated is fully utilized because once pro-

duced, it has to be used and cannot be stored away; otherwise it will go to waste.

Coincidentally, the Sarawak Corridor of Renewable Energy (SCORE) was launched in February 2008, as one of the five regional development corridors being developed throughout Malaysia. The core of SCORE is none other than energy resources, particularly hydropower, coal and natural gas, which are abundantly found within the state. The focus is on hydropower with a projected total potential of 28,000 MW. The development covers a colossal area of 70,708 square kilometres (km^2) in central Sarawak with Bakun dam as the focal point. To date, some RM24 bil (US$7.5 bil) worth of investments have made their way into the state under this provision, while a further RM70 bil (US$21.88 bil) worth of projects have been proposed. By 2030, the Chief Minister of Sarawak, Tan Sri Abdul Taib Mahmud, who is also the key man behind SCORE, expects some RM300 bil (US$93.75 bil) worth of investments to plough into the development area which will ultimately transform Sarawak into an industrialized state and energy hub of Borneo. SCORE is expected to expand Sarawak's economy by fivefold, averaging 8% of annual growth and doubling its population to 4.6 million by then [11].

For that to happen, the state needs to guarantee a sustainable energy supply at a competitive rate in order to encourage continuous inflows of investments and organic growth. Projections by the state's sole electricity supplier, SEB, SCORE will require about 500 MW in 2012 to power up all the industries that operate within the development zone. An increment of fourfold to 2000 MW is estimated by 2014 [12]. By having Bakun and Murum dams under its sleeve, Sarawak is well-prepared for the anticipated substantial growth in electricity demand by industries in SCORE.

It is also understood that the state is in negotiation with several keen investors to finalize the commercial terms of their agreements. Among these include energy-intensive aluminium smelters such as [13,14]:

- Sarawak Aluminium Company (SALCO), an estimated RM6.4 bil (US$2 bil) joint-venture between Cahya Mata Sarawak Ltd. and Australia-based Rio Tinto Alcan which will require 900–1200 MW for an initial annual capacity of up to 720,000 tonnes.
- Smelter Asia, a joint-venture between the local GIIG Holdings and China's Aluminium Corp. which will require at least 600 MW for an initial annual capacity of 330,000 tonnes.

A 720,000 tonnes capacity smelter can create some 1000 direct jobs and 200–300 subcontractors once operational [15]. Therefore, thousands of new job opportunities can be expected from all the various industries that will jump on the Bakun bandwagon.

Other less energy-intensive industries are also believed to have engaged in talks with the state to set up their bases in SCORE, such as poly-silicon, manganese and ferro-silicon industries, which are estimated to require around 150–200 MW to operate. Such industries do not use as much power as smelters and cost of power is not a significant part of their overall costs.

6. Issues and challenges

It is rather evident at this point there is a power glut looming in Sarawak with the submarine cable project terminated. In spite of this, there are plans already underway to develop more hydroelectric dams around the state. The major concern is where all the power should go as there are still no firm commitments from investors. The electricity tariff remains as a main issue yet to be resolved between Sarawak Hidro and SEB. The construction of the Bakun dam has also earned the country unwanted criticisms from environmentalists around the world for the ecological damage it has caused and the improper relocation of the aborigines.

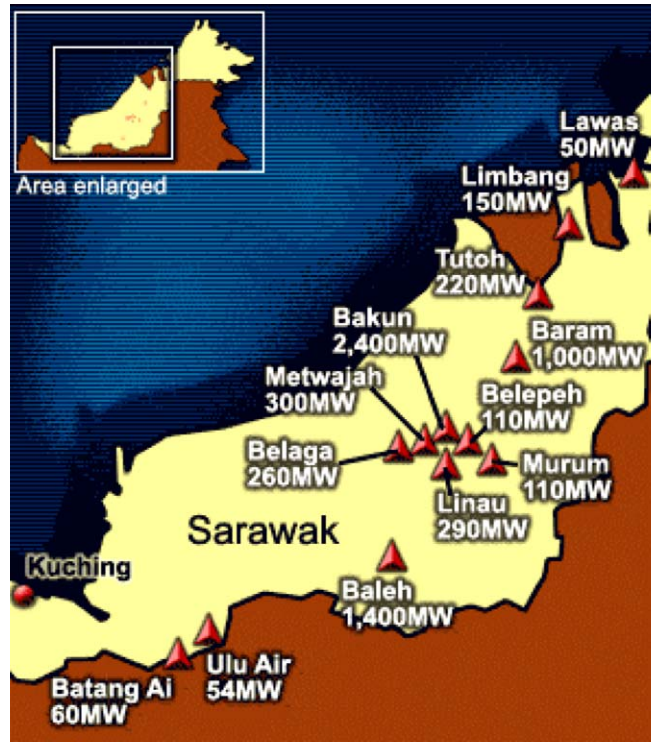


Fig. 6. Early proposed hydroelectric dams in Sarawak [16].

6.1. Power surplus – where should it go?

Sarawak's current generating capacity is close to 1300 MW and its peak demand is around 1000 MW, which translates to an acceptable 30% energy reserve. By having Bakun and Murum hydroelectric dams in the picture, there will be an additional 2400 MW and 944 MW, respectively. The power glut does not stop here as plans to build another few smaller dams are likely to commence soon. Much earlier proposal had seen an impending 12 other dams besides Bakun being planned for the state, as illustrated in Fig. 6. However, Murum has materialized with a much higher capacity of 944 MW instead of 110 MW. Listed in Table 1 is a more recent proposal with a total combined capacity of over 4500 MW. Balleh and Baram dams are seen to have remained with their respective capacity proposed earlier, which are slightly higher than the Murum dam. Although these dams are still in the proposal stage and nothing has yet been finalized, not much difference is to be expected in the final total generation capacity.

Due to the state's natural geographical rainforest terrain, Sarawak's hydropower estimated potential of more than 20,000 MW has never been doubted by anyone. The main concern is to where all the excessive power should go and how can they be fully utilized for the good of the people. Suggestions are abound to

Table 1
Future dams to be built in Sarawak [17,18].

Hydroelectric dam	Capacity (MW)
Balleh	1400
Baram	1000
Limbang	1000
Pelagus	770
Matjawah	300
Lawas	100

leave the dams idle, Bakun in particular, which apparently is not an option considering the vast amount of costs, time and effort that have sunk in its development. Sarawak Hidro may also choose to operate only some and not all the turbines if there is insufficient demand but this step is uneconomical since the same amount of water is required to run either one or all of the turbines. There is a possibility that Bakun might come in handy for SEB when all the gas and coal-fired power plants are shut down for maintenance. Still, this does not cater a long term solution for the matter at hand unless all the fossil-fueled utilities are phased out and replaced by the renewable hydro energy.

Various industries being roped in by the SCORE master plan do look quite promising in the long run, especially the smelters that will consume at least 1500 MW. Unfortunately, most of the large, energy-intensive industries will normally take 3–5 years to materialize. In fact, the initial power demand for SCROE is projected at a meager 500 MW in 2012 and will only reach 2600 MW by 2015, while Bakun will be at its full capacity by end of 2012 and Murum by 2013. The total combined installed capacity from these two dams is 3344 MW with firm available power for use at anytime will be about 2420 MW; 1770 MW from Bakun and 650 MW from Murum. Although the SCORE's projected commitment of 2600 MW by 2015 has exceeded the firm combined capacity of Bakun and Murum (2420 MW), industry players are somehow not convinced that the 2600-MW a year projection will materialize as the number is almost three times of Sarawak's current peak demand and the lacks of firm commitments from potential investors, including the smelters, definitely do not improve the situation. To counter this, other avenues such as relocation of certain energy-hungry industries from the Peninsular to the state should be considered as a feasible move.

While SCORE's projection will just remain as a mere projection, Bakun and Murum are very real with the former's impoundment expected by end of 2010 and the latter is almost 30% completed [19]. Thus, how Sarawak Hidro handles the issue in the interim is very crucial. The situation is quite catchy too as investors are keen to know how SEB is strategizing its position in relation to the Bakun project and SEB needs to have the financial commitment from Sarawak Hidro in terms of their financial models to determine the tariffs.

Plans to export electricity to the surrounding areas within Borneo such as West Kalimantan in Indonesia, Brunei and the neighbouring state Sabah are certainly laudable as suggested by certain parties. But such plans have to be stashed away for the time being because new commitment to export power is unlikely to happen any time soon until Sarawak is able to meet its own anticipated growth of electricity demand. Unless all the other smaller hydroelectric dams really materialize, the export strategy will be viable and excellent for the state's economy growth.

6.2. Electricity tariffs – the Catch 22 situation

In determining the electricity tariff, there has been a lot of haggling for quite some time from both sides of the table as each side is keeping an eye on how much the other will earn over a 30-year concession period. In its preliminary move, SEB has asked Sarawak Hidro (federal government) to exclude compensation and resettlement costs amounting to RM1.5 bil (US$468.75 mil) from the total bill. Sarawak Hidro in return has requested the state to drop the water levy of 1 cent per kWh of electricity generated which will incur an additional cost of about RM150 mil (US$46.88 mil) per year given full-load capacity. This amount if spread over 30 years, will cost Sarawak Hidro RM4.5 bil (US$1.41 bil) just in water levy to the Sarawak Government. This issue is still pending with Sarawak Hidro basing its argument on dams like Pergau and Kenyir are paying only about 0.5 cent per kWh.

As the whole thorny issue is still on the negotiation table, initial talks had seen Sarawak Hidro offering to sell at slightly below 10 cents per kWh, a rate which SEB had balked at. This is substantially lower than the 10–15 cents per kWh range that is envisaged at the federal government level much earlier, taking into account the various costs, interest and compensation. If based on a tariff of 9 cents per kWh, Sarawak Hidro could receive RM1.4 bil (US$437.5 mil) per year or revenue of RM42 bil (US$13.13 bil) over 30 years, after taking into account the water levy payment. The smelters are reported to be willing to pay 4 US cents (close to 13 cents based on RM3.20 per US$1) per kWh and SEB has offered to buy at 6–7 cents per kWh only. Not that SEB will be at the losing end if it agrees to Sarawak Hidro's offer, as industry observers have indicated that even if SEB were to buy from Sarawak Hidro at 9 cents per kWh, pay 2 cents per kWh for transmission costs, and earn only 1 cent by charging the smelters 12 cents per kWh, SEB can still make a profit of RM150 mil (US$46.88 mil) per year at a full load of 15.5 GWh. This translates to revenue of RM4.5 bil (US$1.41 bil) over 30 years. If the smelters are willing to pay 13 cents per kWh, its profit will double.

It is understandable that different rates are charged for different types of users, and obviously Sarawak's primary clients will be those in the energy-intensive industries. Based on estimates from industry sources and SEB's 2008 annual report, the average cost of generation is about 17 cents per kWh [20]. The cost can be substantially further reduced when Bakun comes into play. Assuming that it can sell all the power at an average rate of 15 cents per kWh to both consumers and industries, it will profit RM2.3 bil (US$718.75 mil) per year which translates to almost RM70 bil (US$21.88 bil) over a 30-year span. But by making a low 6–7 cents per kWh offer to Sarawak Hidro, it appears that SEB is aiming for a lot more. This might also be one of the precautionary steps taken by SEB due to the fact that since the power usage is likely only to take off in 2015, with lower tariffs, it will help to mitigate the situation while the firm tries to secure more investment deals from other heavy users. Eventually, it has become obvious that SEB has yet to make a firm decision to buy from Sarawak Hidro because it itself in turn does not have firm commitments from anyone to purchase the power.

SEB is expected to submit a new proposal to Sarawak Hidro for lower tariffs during the ramp-up period between 2011 and 2015. At this stage, the state should make a firm commitment to its end users and then proceed to negotiate with the power guzzlers. Sarawak with its SCORE plan is confident of attracting huge industries but it is oblivious that any further delay in signing the power purchase agreement (PPA) with Sarawak Hidro will do neither side any good as it will result in not being able to commit a proper tariff rate to its potential clients [21].

At this juncture, Sarawak Hidro as the developer and owner of the Bakun dam must assess the whole circumstances over the 30-year concession period so as to reach an optimum market-driven scenario in order to service all its debts and achieve a reasonable rate of return to the public. Additionally, if it were to lower the tariffs for the first 5 years to align with the situation in Sarawak, it would then have to assess the future tariff levels against its projected costs which should cover all possible losses incurred during that period.

Talks are also rife that SEB is eyeing to buyout the mammoth Bakun project from Sarawak Hidro which might turn out to be a solution for the current impasse, but negotiations have come to a dispute over what its cost should entail. While certain quarters that include Sarawak Hidro's chairman, maintain that the appropriate way to move forward is secure the ideal price through negotiation, others feel that the federal government should cut losses if a satisfactory offer is put on the table. SEB has made an indicative offer of RM6 bil (US$1.88 bil) which excludes compensation and resettlement costs, compared to Sarawak Hidro's asking price of RM8

bil (US$2.5 bil) which factor in the estimated impoundment delay costs by the time everything is ironed out [22].

6.3. Environmental damage

In the very beginning when the Bakun project was first announced back in the 1980s, it had garnered severe criticisms from both environmentalists and social activists, who have vigorously opposed the project, saying it will destroy a vast tract of rainforests and force about 10,000 villagers from their homes. Once impounded, it will put 700 km^2 of virgin rainforests and prime farmlands under water. Large dams normally create irreversible environmental damage to flora and fauna. Moreover, the rainforest at this part of Southeast Asia which touted to be the second oldest in the world, has some of the highest rates of plant and animal endemism, species found there and nowhere else, and this dam has done permanent ecological damage to it by cutting down a total of 230 km^2 of virgin tropical rainforest.

It is also a known fact that once a large dam is built, it will alter the hydrology of the rivers; from the way the currents flow to the pressure on the river banks, making it almost impossible to predict and thus, posing danger to those who rely on these waterways to commute. Despite this, by changing water quality and river flow patterns, it would potentially affect the thousands of people living downstream of the dam, on the Rajang River, which is the longest river in Malaysia. More to the point, as a result from climate change, large hydroelectric dams are neither assured of perpetual water supply nor against the undermining of the integrity of water catchments, further raising question of the viability of such projects.

The environmental issue will not just stop once the dam is completed because as Bakun starts to build up its power, it is just a matter of time before heavy industries start coming into the area, such as the aluminium smelters. It turns out that converting bauxite (aluminium ore) into aluminium metal is the most energy-intensive industrial process in the world, that aluminium producers use more electricity than any other industry and are significant contributors to global warming and environmental pollution and degradation [23]. Aluminium smelting results in gaseous emissions and solid wastes contaminated with fluorides and cyanide that affect people with respiratory problems.

6.4. Social impact

Major criticisms from national and international bodies are directed to the Bakun project on its costs and benefits, particularly towards the indigenous peoples who were said to have been displaced and lost their native lands and main source of livelihood, hence hurting the communities' survival as a whole which has been long depended on Sarawak's rivers and forests. The resettlement of almost 10,000 native residents (mostly Kayan, Kenyah, Kajang, Ukit and Penan ethnic groups) mostly lived in the area to be flooded is reported to have cost RM500 mil (US$156.25 mil). Many are reported to have relocated to longhouse settlements along Asap River, some 30 km from the dam, despite being subsistence farmers for generations with no previous participation in the Sarawak's economy. Grave concerns are raised on how the resettlement has affected the livelihood of the aborigines and also how compensations are made to them.

Even though more than a decade has passed since the resettlement, perpetual laments still abound from the relocated natives and recent surveys conducted by non-government organizations (NGOs) found that [24,25]:

- 1640 families which have moved to along Hilir Balui to Asap River are yet to be compensated.
- The natives' demand for land of 10-ha per family is only met with a promise of 3 ha, but some only received 1.2 ha of bad cultivation land, many which are infertile and prone to flash floods. This has led the natives to farm beyond their allotted lands and is evicted by the Land and Survey Department in 2007.
- According to the Borneo Institute of Research, the idea was for the natives to work in plantations, instead of growing their own food. A survey found that jobs are scarce and many are living off their meager compensation.
- The promises of roads, shops and other amenities and facilities such as schools, clinics, electricity and water have yet to be fulfilled in many resettlements, while areas that do have electricity and water supplies, are slapped with high lump sum bills between 1998 and 2008.
- The longhouses are not awarded any certificates of fitness and are shoddily built with woods that begin to rot barely a year.
- Those involved in the Asap River resettlement longhouses are requested to fork out RM50,000–RM60,000 (US$15,600–US$19,000) for an apartment unit if they want one, instead of being awarded free as compensations.

Even though it is a national policy to involve affected communities in dam-building projects, the obstacles to effective participation are manifold. In the case of the Bakun dam, for example, the Dayak communities were provided minimal information about the project, denied access to the Environmental Impact Assessment and was denounced as anti-development when they objected to the proposed resettlement plan. Dayak leaders had their passports taken away to prevent them travelling overseas to speak out against the project and NGOs supporting the indigenous communities suffered harassment and repression. Lawyers from the Peninsular acting for the affected people were denied access to the state. Communities were threatened with withdrawal of state benefits and services if they persisted with their opposition. Dissent was quashed and they were obliged to sign contracts accepting the relocation, in change of new housing and land in the resettlement area [26].

Problems listed above can just be the tip of an iceberg and have surely raised apprehension over the communities' participation in decision making and informed consent, compensation as well as adequate housing and basic facilities, and thus implicate their human rights. Other concerns that have been raised include the threat of possible dam collapse, upstream sedimentation accumulation that could shorten the useful lifespan of the dam and increase in water-borne diseases such as shistosomiasis and malaria.

7. Conclusion

Malaysia's essential problem now is derived from its preliminary plan to solve the power shortage problem expected in the Peninsular by 2015. That problem remains to be solved and now it is stymied by yet another in Sarawak. The dam is originally built to sustain the power industry in Peninsular via an undersea cable which plan has now been removed due to a belated recognition that it is not technically feasible. Due to this, the federal government has opted for more coal-fired plants to be built in Peninsular to meet the demand; two locations have been identified to build a 1000 MW plant each, with one has been tendered to TNB recently [27]. Because the dam is so poorly conceived, what palpable now is that the energy from Bakun dam will most likely serve no useful purpose in the coming 5 years at least, and it is going to be a daunting task on how to handle the extreme oversupply.

In the midst of the rudderless, it will be interesting to see how the tariffs will play out in the strife between the federal and

state governments, and the industry players. With all contending pressure mounting, both politically and socially, plus the lack of affirmative action, the federal government might just accede to the state's demand for cheaper electricity. Sarawak definitely has the upper hand for now as the sole buyer of all the power coming from Bakun after the submarine cable project is discarded. Whether or not the cable plan will resurface again in the future is still everyone's guessing.

From its sheer costs and efforts alone, Bakun definitely deserves full operating levels as soon as possible and should be justifiable that it can bring more benefits than incur damages to the general public. But ironically, after all the monies spent and all the damages done along the way, it has become obvious the public is not going to benefit much from it, at least not in the near future. It is indeed a case of too much too late.

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